IN THE CLAIMS

What is claimed is:

1. An optical grating, comprising:

a background region of a first material having a first refractive index; and

a grid of cells within said background region, wherein said cells are of a second material having a second refractive index.

2. The optical grating of claim 1, wherein said grid is two-dimensional, thereby making the optical grating a planar grating.

3. The optical grating of claim 1, wherein said grid is three-dimensional, thereby making the optical grating a cubical grating.

4. The optical grating of claim 1, wherein a plurality of said cells each have at least one incident surface pitched such that, when the optical grating receives a light beam, first portions thereof may strike said incident surfaces and be reflected there from as reflected beams.

5. The optical grating of claim 4, wherein said plurality of said cells have cell-to-cell separations such that said reflected beams will constructively interfere for a pre-determined light wavelength when it is present in said light beam.

6. The optical grating of claim 4, wherein:

said plurality of said cells also each have opposed surfaces, respective to said incident surfaces; and

said incident surfaces are additionally pitched such that, when the optical grating receives said light beam, second portions thereof may enter said cell, travel to said opposed surfaces, be reflected there from, travel back to said incident surfaces, and exit said cell as refracted beams.

7. The optical grating of claim 6, wherein said at least one incident surface and respective opposed surface have surface-to-surface optical separations such that said reflected beam and

said refracted beam will constructively interfere for a light wavelength when it is present in said light beam.

8. The optical grating of claim 7, wherein said plurality of said cells have cell-to-cell separations such that said reflected beams will also constructively interfere for said light wavelength.

9. The optical grating of claim 1, wherein:

said grid is two-dimensional; and

said cells have a first set of surface-to-surface separations and a first set of cell-to-cell separations such that constructive interference will occur for a first light wavelength when it is present in said light beam.

10. The optical grating of claim 9, wherein said cells further have a second set of surface-to-surface separations and a second set of cell-to-cell separations such that constructive interference will occur for a second light wavelength when it is present in said light beam.

11. The optical grating of claim 1, wherein:

said grid is three-dimensional; and

said cells have a first set of surface-to-surface separations and a first set of cell-to-cell separations such that constructive interference will occur for a first light wavelength when it is present in said light beam.

12. The optical grating of claim 11, wherein said cells further have a second set of surface-to-surface separations and a second set of cell-to-cell separations such that constructive interference will occur for a second light wavelength when it is present in said light beam.

13. The optical grating of claim 12, wherein said cells further have a third set of surface-to-surface separations and a third set of cell-to-cell separations such that constructive interference will occur for a third light wavelength when it is present in said light beam.

14. The optical grating of claim 1, wherein said grid of cells have at least one set of surface-to-surface separations and cell-to-cell separations based on Bragg's law for a specific light wavelength.

15. The optical grating of claim 1, wherein said first material and said second material are members of the set of consisting of silicon wafer, glass, amorphous silicon-hydrate (SiH, SiH2, SiH3, SiH4), Si, Ge, GaAs, SiO2, Al2O3, MgF2, B, P, ZnSe, ZnS, GaP, SrTiO3, InSb, YSZ, AlAs, BaTiO3, BiSiO20, Bi12GeO20, AlN, BN, AgGaS2, LiTaO3, CuCaS2, TlI, TlCl, TlBr, AgCl, AgBr, AgI, AgGaSe2, and KnbO3.

16. The optical grating of claim 1, wherein said first material and said second material are of a same base material and at least one is altered by doping with an impurity to distinguish said first refractive index from said second refractive index.

17. A method for fabricating an optical grating, the method comprising the steps of:

(a) providing a background region of a first material having a first refractive index;

(b) providing a grid of cells within said background region, wherein said cells are of a second material having a second refractive index.

18. The method of claim 17, wherein said step (a) includes defining a portion of a substrate inherently having said first refractive index to be said background region.

19. The method of claim 17, wherein said step (a) includes altering a portion of a substrate by doping with an impurity to impart said background region with said first refractive index.

20. The method of claim 19, wherein said step (a) includes doping with said impurity such that said first refractive index has a gradient.

21. The method of claim 20, wherein said step (a) includes imparting said gradient by controlling temperature.

22. The method of claim 17, wherein said step (b) includes providing said cells with said second material such that said second refractive index varies along a gradient.

23. The method of claim 17, wherein said step (b) includes providing said grid in two-dimensions, thereby making the optical grating a planar grating.

24. The method of claim 23, wherein said step (b) further includes providing said cells with a first set of surface-to-surface separations and cell-to-cell separations such that constructive interference will occur for a first light wavelength when it is present in a light beam entering the optical grating.

25. The method of claim 24, wherein said step (b) further includes providing said cells with a second set of surface-to-surface separations and cell-to-cell separations such that constructive interference will occur for a second light wavelength when it is present in said light beam.

26. The method of claim 17, wherein said step (b) includes providing said grid in three dimensions, thereby making the optical grating a cubical grating.

27. The method of claim 26, wherein said step (b) further includes providing said cells with a first set of surface-to-surface separations and cell-to-cell separations such that constructive interference will occur for a first light wavelength when it is present in a light beam entering the optical grating.

28. The method of claim 27, wherein said step (b) further includes providing said cells with a second set of surface-to-surface separations and cell-to-cell separations such that constructive interference will occur for a second light wavelength when it is present in said light beam.

29. The method of claim 28, wherein said step (b) further includes providing said cells with a third set of surface-to-surface separations and cell-to-cell separations such that constructive interference will occur for a third light wavelength when it is present in said light beam.